

REMARKS

Claim Status

Claims 1-21 are pending, with claim 1 being the sole independent claim. Claims 1-18 have been amended. The amendments to claims 1-8, 11-14 and 16-18 are to correct minor informalities, and are cosmetic in nature. Claims 19-21 have been added. No new matter has been added by way of the above amendments. Reconsideration of the application, as amended, is respectfully requested.

Overview of the Office Action

Claims 9, 10 and 15 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Withdrawal of this rejection is in order.

Claims 1-4 and 6-8 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,535,537 (“*Kinoshita*”), while claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Kinoshita* in view of U.S. Patent No. 6,636,539 (“*Martinsen*”). Applicants have carefully considered the Examiner’s rejections, and the comments provided in support thereof, and respectfully disagree with the Examiner’s analysis. For the reasons which follow, it is respectfully submitted that all claims of the present application are patentable over the cited references.

Amendments Addressing Section 112 Issues and Formalities

The Examiner states that “the active layer (16) of the pump laser (5) and/or the active layer (13)” in claim 9 lacks antecedent basis. In response to this rejection, Applicants have

amended claim 9 in a manner which is self-explanatory. Reconsideration and withdrawal of the rejection are respectfully requested.

The Examiner has also stated it is unclear whether claims 10 and 15 are method or apparatus claims because each claim recites the limitation “formed jointly in one epitaxy step”.

With respect to this rejection, the feature “formed jointly in one epitaxy step” in claims 10 and 15 defines that the active layers of the vertical emitter and the pump laser can be formed identically, and in particular, by means of a single epitaxial growth step (see pg. 3, paragraph [0008] of the originally filed specification). In the final product, this feature may be verified by comparing the crystal structures of the active layers of the pump laser and the vertical emitter, which structures resemble each other, because the active layers were formed jointly in one epitaxy step. As stated by the Examiner, the feature “formed jointly in one epitaxy step” is an apparatus limitation. Accordingly, claims 10 and 15 are definite and, therefore, reconsideration and withdrawal of the rejection are respectfully requested.

Descriptive Summary of the Prior Art

Kinoshita discloses “an optical amplification and/or light emitting element, such as a surface-emitting element or a surface-emitting amplifier comprising a medium having the function of light emission or optical amplification, including lasing, and a lasing structure surrounding the medium” (see col. 1, lines 7-12).

Martinsen discloses “a method and apparatus for controlling temperature variations in a laser or other optical device” (see col. 1, lines 9-10). *Martinsen* discloses that “the size of the heat sink interface is adapted to correspond to a region of principal heat generation within the

device[, which causes] the heat generating region within the device [to] have a more laterally uniform temperature gradient" (see *Abstract*).

Summary of Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

A semiconductor laser apparatus is formed with a vertical emitter and a pump laser for optical pumping of the vertical emitter, wherein the pump laser and the vertical emitter are monolithically integrated. During operation, the pump laser has a radiation-emitting zone at a first temperature, and the vertical emitter has a radiation-emitting zone at a second temperature, which is higher than the first temperature (see pgs. 2-3, paragraph [0005] of the originally filed specification).

This advantageously results, on the basis of the temperature dependency of the emission wavelength, in the emission wavelength of the vertical emitter being higher than the emission wavelength of the pump laser even with radiation-emitting zones whose structure is otherwise the same. Consequently, it becomes possible to produce the pump laser and the vertical emitter jointly by means of an epitaxy method without the need to manufacture the pump laser and the vertical emitter in separate, successive epitaxy steps (see pg. 3, paragraph [0008] of the originally filed specification).

Patentability of the Independent claims over the Prior art Under 35 U.S.C. 102

The Examiner contends (pg. 3 of the Office Action) that:

Kinoshita discloses in Fig. 1B a semiconductor laser apparatus having a vertical emitter (1-6) and having at least one pump laser (on

the sides) for optically pumping the vertical emitter with the vertical emitter and the pump laser being monolithically integrated. It is inherent that a radiation emitting zone of the pump laser produces less heat/lower temperature than that of the vertical emitter because the vertical emitter provide more powerful laser beam than that of the pump laser.

For the following reason, Applicants respectfully disagree with the foregoing statement.

Independent claim 1 recites the limitation “during operation, the pump laser has a radiation-emitting zone at a first temperature T1 and the vertical emitter has a radiation-emitting zone at a second temperature T2, and the first temperature T1 is lower than the second temperature T2”.

Claim 1 requires the temperature T1 of the vertical emitter (2) to be higher than the temperature T2 of the pump laser (5), i.e. T1 must be greater than T2. See paragraphs [0030], [0039], [0040] and [0044] of the present specification for explanatory details.

In contrast, *Kinoshita* (col. 5, lines 39-48) suggests that most of the heat that is generated during operation of the device occurs extensively in electrically pumped semiconductor laser devices. *Kinoshita* (col. 5, lines 44-48) specifically states, “since no current passes through the mesa 10 that is the vertical resonator, it is possible to avoid the problem of temperature rise due to a high current density, which can occur in a conventional [vertical cavity surface emitting laser] (VCSEL)”. That is, *Kinoshita* teaches that the pump laser (i.e., the only electrically pumped laser described therein) has a temperature that is higher than the temperature of the vertical emitter 10, because a temperature rise in the vertical emitter is avoided by eliminating current flow through the mesa 10, i.e. the vertical emitter. In short, *Kinoshita* teaches that current flows only through the pump laser 20. Hence, *Kinoshita* teaches that the vertical emitter has a temperature that is lower than the temperature of the pump laser 20, which is an electrically pumped laser. Consequently, *Kinoshita* fails to teach, either explicitly or inherently, the features related to temperatures recited in claim 1. Rather, *Kinoshita* explicitly discloses the exact

opposite temperature distribution between the lasers, i.e., T2 is greater than T1. Accordingly, *Kinoshita* teaches away from the invention, since claim 1 refers to the opposite situation regarding the temperatures of a pump laser and a vertical emitter, as compared to *Kinoshita*.

In view of the foregoing, Applicants respectfully assert that *Kinoshita* fails to anticipate independent claim 1. Therefore, reconsideration and withdrawal of the rejection under 35 U.S.C. §102 are in order, and a notice to that effect is earnestly solicited.

Moreover, due to the fundamental above-discussed difference between the present claimed invention and *Kinoshita*, it is clear that the present invention is patentable over this reference under 35 U.S.C. §103.

Patentability of the Independent claims over the Prior art Under 35 U.S.C. 103

The Examiner has cited *Martinsen* based on the failure of *Kinoshita* to teach or suggest a pump laser and vertical emitter being arranged between the substrate and mount, as recited in dependent claim 5. However, *Martinsen* fails to cure the deficiencies of *Kinoshita*, since *Martinsen* also fails to teach the features related to temperatures, as recited in independent claim 1. Consequently, dependent claim 5 is patentable over the combination of *Kinoshita* and *Martinsen* based on the dependency of claim 5 on claim 1, and a notice to that effect is earnestly solicited.

Dependent Claims

In view of the patentability of independent claim 1, for the reasons presented above, each of dependent claims 2-18 and new claims 19-21 is patentable over the prior art along with claim 1.

Conclusion

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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